Remarks

In the office action dated October 15, 2001, the Examiner:

- rejected claims 1-24 as being indefinite under 35 U.S.C. 112, second paragraph, and
- objected to the drawings, and in particular objected to the reference numeral (23) shown in Figs. 1-3 as lacking a lead line.

After entry of this amendment, the pending claims are: claims 1-29. Reconsideration of the present application is respectfully requested.

Interview Summary

The Applicants wish to thank the Examiner for granting a telephonic interview on December 5, 2001 with the undersigned representative, Wilfred Lam (Reg. No. 41,923), and William Ahmann. The claim rejections and objections of the Office Action were discussed, but no conclusion was reached. The Examiner, however, indicated that he found it difficult to visualize the claimed invention despite the fact that a person of ordinary skill in the art would understand the claimed invention upon reading the disclosure, and invited the Applicants to submit a side view or a perspective view of a device as claimed.

Claims 1 and 12

Contrary to the Office Action, the use of the term "counterweight" in independent claims 1 and 12 is not vague, indefinite or confusing. In particular, contrary to the Office Action, the counterweight 36 of Fig. 1 is not a mere support and/or base structure for the optical micro-electromechanical device 20. It is important to realize that Fig. 1 is a top view of the optoelectromechanical device 20. It is also important to realize that the torsional beam 26, the mirror head 32 and the counterweight 36 are suspended above the substrate 23 by at least the torsional beam 24. Thus, with respect to Fig. 1, at least the weight of the mirror head 32 and the torsional beam 26 is counter-balanced by the weight of the counterweight 36.

The Examiner's attention is respectfully directed to the thesis entitled "Design and Properties of a Torsional Micromechanical Tunable Optical Filter" (hereinafter, "the thesis"), by one of the applicants Jeffrey M. Waite, which the Applicants submit herewith in an accompanying Information Disclosure Statement to help the Examiner visualize the

invention. An SEM-photograph of an optical micro-electromechanical device having a structure similar to that shown in Fig. 1 of the present application is illustrated on page 46 (Fig. 26) of the thesis. As shown in the SEM-photograph, the "counterweight" counterbalances the weight of the "cantilever." Figs. 13 and 27 of the thesis, on pages 25 and 47, respectively, show a mirror head that has been undercut during the selective etch and is not touching the substrate beneath it. Figs. 22 and 26 on pages 38 and 46, respectively, show a counterweight that is similarly suspended over the substrate.

Claim 12 has been amended to correct a typographical error.

In view of the foregoing, the Applicants respectfully submit that Claims 1 and 12 meet the requirements of 35 U.S.C. 112 and are in condition for allowance.

Claims 7-11 and 13-19

In the Office Action, claims 7-11and 13-19 are rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as their invention. In particular, the Office Action indicated that it is unclear how the device is configured as a laser, an optical detector, an optical filter, an optical amplifier and an optical attenuator.

As described in the specification on page 12, line 28 to page 13, line 4, optical filtering is often achieved through the use of a Fabry-Perot cavity. In its simplest form, a Fabry-Perot cavity consists of two mirrors separated by an air gap. For high-quality filter design, Distributed Bragg Reflectors (DBRs) are grown into the crystal to act as mirrors. These DBRs consist of alternating layers of high and low index of refraction materials with an optical thickness of one-quarter of the wavelength of interest.

As described on page 16 of the present application, the wafer shown in Fig. 9 may be modified to include a Lambda cavity above the first DBR pair that is on top of the GaAs substrate. Within the Lambda cavity is an active layer. On top of the lambda cavity is an oxidation layer. An additional DBR pair is then positioned on the oxidation layer. The three

DBR pairs are doped to provide an N-P-N or P-N-P structure. This configuration can be used to form a laser. A P-N junction may also be formed under the mirror head 32 to operate the device as an optical detector. Similar structural modifications may be utilized to operate the structure of the invention as an optical amplifier and an optical attenuator. U.S. Patent 6,026,108 cited in the specification and submitted herewith in an accompanying IDS describes structures that may be utilized in accordance with the invention.

Thus, in view of the foregoing, the Applicants respectfully submit that it is clear how the optical electromechanical device can be configured as a laser, an optical detector, an optical filter, an optical amplifier and an optical attenuator. Accordingly, claims 7-11 and 13-19 meet the requirements of 35 U.S.C. 112 and are in condition for allowance.

The Drawings

Contrary to the Office Action, the reference numeral 23 does not require a lead line. The substrate 23 is located underneath device 20 (see Fig. 1). As described in the specification at page 4, lines 24-29, the contacts 22A-22B are attached to substrate 23 and the remaining components of device 20 are suspended over the substrate 23. Accordingly, the drawings do not require correction.

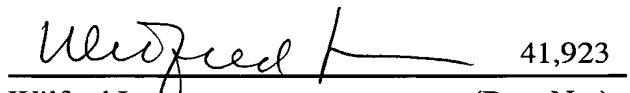
New claims 25-29

Applicants respectfully submit new claims 25-29 for examination. Applicants respectfully submit new claims 25-29 meet the requirements of 35 U.S.C. 112 and are in condition for allowance.

In light of the above amendments and remarks, the Applicants respectfully request that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney if a telephone call could help resolve any remaining items.

Respectfully submitted,

Date: December 21, 2001



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Enclosure

Appendix A
Marked-up Version of Revised Claims

12. (Amended) A method of operating an optical micro-electromechanical device, said method comprising the steps of:

positioning a mirror assembly over a substrate, said mirror assembling including a torsional beam attached to said substrate, a cantilever with a cantilever first end and a cantilever second end, said cantilever first end being attached to said torsional beam, said cantilever second end supporting a mirror head, a connector attached to said torsional beam, and a counterweight attached to said connector; and

applying an electrical bias to said substrate so as to create an electrostatic attraction between said counterweight and said substrate, which causes said torsional beam to rotate and thereby [re-reposition] re-position said mirror head.